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## **Expert Reviewer's Report (#2025-18)**

Thursday, July 31, 2025

Dear Prof. Hase,

Thank you for giving me the opportunity to contribute as a reviewer for the IEEE Milestone Program. Below, I provide the results of the review for Milestone-Proposal: "Sakuma Frequency Converter Station, 1965".

### **1. Is suggested wording of the Plaque Citation accurate?**

Yes, I agree that the wording of the Plaque Citation is accurate and describes the important historical essence and the value of its achievements.

### **2. Is evidence presented in the proposal of sufficient substance and accuracy to support the Plaque Citation?**

Yes, the evidence presented in the proposal is sufficient and accurate to support the Plaque Citation. The following points are adequately demonstrated in the proposal and accompanying materials:

- The Sakuma Frequency Converter Station was completed in 1965 by Electric Power Development Co., Ltd.
- The Sakuma Station enabled the first large-scale power exchange between Japan's eastern 50 Hz and western 60 Hz grids via a 300 MW motor-generator frequency converter.
- The Sakuma Station's achievement addressed a long-standing national frequency division, improving grid reliability, resilience, and laying the foundation for Japan's future energy interconnection infrastructure.

### **3. Does proposed milestone represent a significant technical achievement?**

Yes, the proposed milestone presents the following significant technical achievements.

- Based on the historical development of Japanese electric power system, Japanese grids has been divided into two regions; eastern 50 Hz and western 60 Hz grids. This situation was very unique in the world and a 300 MW motor-generator frequency converter in the Sakuma Station enabled the first large-scale rapid bidirectional power exchange between these two grids.

- The core principle developed at Sakuma — connecting asynchronous grids while maintaining regional independence — continues to shape Japan's modern power system, particularly as renewable energy and grid resilience gain importance.

**4. Were there similar or competing achievements? If so, have the proposers adequately described these and their relationship to the achievement being proposed?**

Yes, the proposers adequately described similar or competing achievements and their relationship to the achievement at the Sakuma Station. Instead of HVDC technology used in Europe and North America, the Sakuma Station relied on mechanical frequency conversion (MFC) by coupling a 50 Hz synchronous motor and a 60 Hz synchronous generator on a common shaft to interconnect Japanese unique dual-frequency grids. This method allowed reliable frequency decoupling and rapid power reversal. The Sakuma Station's supporting infrastructure included specially designed transformers, control and protection systems, and acoustic measures to minimize environmental impact.

**5. Have proposers shown a clear benefit to humanity?**

Yes, proposers have shown a clear benefit to humanity. As a critical link in Japanese unique dual-frequency electric power system, the Sakuma Frequency Converter Station enabled real-time power balancing between eastern and western Japan, greatly contributing to national grid stability and energy security, including mutual emergency energy support, particularly in times of natural disaster, such as earthquakes or typhoons.

**Conclusion**

As stated above, the achievement at the Sakuma Frequency Converter Station has had a significant impact on the development of the Japanese Electric Power System. I strongly recommend registering this proposal as an IEEE Milestone.

Sincerely yours,



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CIGRE Distinguished Member